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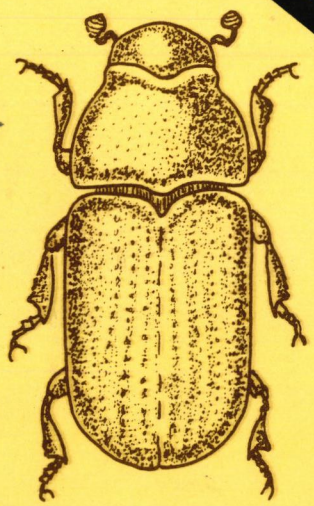
BIOLOGICAL EVALUATION
Douglas-fir Tussock Moth Infestation

Los Alamos County
New Mexico

1977



Southwestern Region

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Forest Insect and Disease Management
State and Private Forestry
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INTRODUCTION

The Douglas-fir tussock moth, Orgyia pseudotsugata McD., has defoliated fir and ornamental spruce trees in Los Alamos, New Mexico, since 1968. The infestation has occurred primarily on ornamental spruce and white fir within the city and does not appear to have exhibited the cyclic outbreak pattern consistent with populations monitored in other forest situations. In 1976, light defoliation and numerous egg masses were first observed on forested land in Pueblo and Los Alamos Canyons. By 1977, moderate to complete defoliation occurred on 600 acres of mixed conifer type. At the request of the County of Los Alamos and the U.S. Department of Energy, an evaluation was made on the forested lands within the county (Federal, county, and private ownership) to delineate the infestation boundaries and determine the potential for damage in 1978.

A biological evaluation was conducted by Anthony H. Smith, New Mexico Department of Agriculture, and David G. Holland, U.S. Forest Service, on October 5-6, 1977. Results of the surveys indicate an increase in population density and tree defoliation in 1978.

TECHNICAL INFORMATION

Insect.--Douglas-fir tussock moth, Orgyia pseudotsugata McD.

Hosts.--White fir, Abies concolor (Gord. & Glend.) Lindl.
Douglas-fir, Pseudotsuga menziesii var. glauca (Beissen.) Franco
Ornamental blue spruce, Picea pungens Engelm.

Location.--Los Alamos and Pueblo Canyons, Los Alamos, New Mexico (Fig. 1)

Type of Damage.--Douglas-fir tussock moth larvae damage host trees by feeding on the foliage. Newly hatched larvae feed on the new foliage causing it to shrivel and turn brown. Later, third stage and larger larvae feed on both old and new foliage. They first strip needles from the tops of trees and outermost portions of the branches; then they feed lower in the crown and farther back on the branches. Defoliation by the tussock moth greatly retards tree growth, can kill and top-kill trees, and weaken trees to the point where they can be killed by other insects.

Extent of Damage.--Defoliation and abundant egg masses were observed on 1,300 acres of forested land. A total of 552 ornamental host trees of private ownership were found to be infested.

METHODS

The infestation in Los Alamos comprises two separate situations: the forested areas within Los Alamos and Pueblo Canyons, and the ornamental host trees on private ownership within the city. The forested areas were surveyed for larval and egg mass densities and defoliation. Townsite trees were surveyed for egg masses and defoliation.

Larval sampling was conducted in early June when larvae were second to third stage. Host trees were randomly selected for sampling at midcrown according to methods described by Mason.1/ Midcrown density was recorded as larvae per 1,000 square inches of foliage.

A total of 3,000 acres of forested land within the county was surveyed in October for defoliation and egg masses. Defoliation was estimated visually from the ground. Stands of host trees were checked for the presence of egg masses and cocoons. If egg masses were not visible, branch samples were collected using pole pruners. Trees with no egg masses or cocoons were considered uninfested. To determine the incidence of natural virus in the population, 100 egg masses were sent to the Forestry Sciences Laboratory at Corvallis, Oregon.

In November, townsite trees were surveyed for defoliation and egg masses. All host trees were mapped by ownership on a county map and designated infested or unifested.

RESULTS AND DISCUSSION

Larval survey results indicate high population densities of the tussock moth. Larval densities ranged from 22 to 107 larvae per 1,000 square inches, with the average at 64 larvae per 1,000 square inches (Table 1). These high densities resulted in defoliation on 1,300 acres of forest lands within Los Alamos and Pueblo Canyons (Table 2). A survey of defoliation and egg masses on townsite trees indicated 552 trees infested (Table 3).

Population densities of the tussock moth and the acreage defoliated increased from 1976 to 1977. This trend is expected to continue from 1977 to 1978, with an increase in larval densities and an increase from 700 to 1,000 acres of heavy defoliation. In 1978, some areas will receive the second consecutive year of heavy defoliation, which could cause some scattered top-kill and tree mortality.

1/ Mason, R. R. 1970. Development of sampling methods for the Douglas-fir tussock Moth, Hemerocampa pseudotsugata (Lepidoptera: Lymantriidae). Can. Entomol. 102: 836-845.

The forested canyons affected by this defoliator are high-use sites that adjoin residential areas. The defoliation will be aesthetically displeasing, and recreational values will be adversely affected. Visitor use of picnic areas and trails in the canyons could be curtailed by the infestation.

ALTERNATIVES

Several alternative strategies are available to the land manager to effectively deal with this insect problem. The alternatives, their advantages and disadvantages, follow:

1. No Action

The outbreak would be allowed to run its course until brought under control by natural means such as virus, parasites, predators, and/or weather.

The advantage to this alternative is that there would be no pesticide contamination of the area. In addition, temporary increases in water yield and game forage, resulting from the reduction of forest cover, could result from this alternative.

Disadvantages to no action are loss of trees, cost of reforestation, and adverse effects on aesthetic and recreation values. Los Alamos and Pueblo Canyons have several trails and picnic areas which would become undesirable if the forest cover were removed by defoliation. Dead trees and dead tops would have to be removed to reduce hazards to users, thus increasing maintenance costs.

2. Direct Suppression

Delivery of pesticides to the target organisms can be accomplished by ground or aerial application. Ground equipment involves the use of hydraulic sprayer, mist blowers, etc., and is used in easily accessible areas with trees in the 10-50 height range. Aerial application equipment involves the use of fixed- or rotary-wing aircraft, and is primarily used on larger, less accessible acreages due to economy.

a. Chemicals would provide larval suppression in the early stages, thus insuring protection of existing foliage. Carbaryl (Sevin®-4-oil) and Dibrom® are currently registered with the Environmental Protection Agency. Sevin®-4-oil is registered for aerial use, and Dibrom® is registered for ground application.

Disadvantages to the use of chemical insecticides are adverse effects caused by deposit in streams, soil, vegetation, litter, or an increase in the residue levels in fish, wildlife, or domestic animals.

b. Microbial insecticides would provide control without contamination of the area. Currently, the nucleopolyhedrosis virus (NPV) and several formulations of Bacillus thuringiensis (B.t.) are registered by the Environmental Protection Agency for use against the tussock moth.

The disadvantages to using microbial agents are the need for exact biological timing of application to insure maximum effectiveness, a slower mortality rate resulting in additional foliage loss, and a more climate-sensitive material with shorter residual activity which could reduce effectiveness. Generally, microbial insecticides provide long-term population reduction, while sacrificing immediate suppression and foliage protection.

RECOMMENDATIONS

The results of the larval, egg mass, and defoliation surveys indicate an increase in population densities and subsequent defoliation in 1978. If no action is initiated, this population increase will result in heavy defoliation, causing some top-kill and tree mortality. To prevent unsightly defoliation, tree damage, and related impacts upon forest and recreational values of these areas, a suppression project is recommended in the spring of 1978.

Several alternatives to the proposed action have been reviewed, including no action. In considering the various alternatives, environmental safety and economic feasibility become primary criteria for selecting a control strategy.

Aerial application is recommended for the forested lands within Los Alamos and Pueblo Canyons because of the large acreage (1,300 acres) and the inaccessibility for ground equipment. Of the pesticides registered for aerial use, the NPV is recommended because of its environmental safety, ability to augment the natural virus in the population, and its potential to effect long-term suppression. The virus has no adverse effects on non-target organisms and, therefore, will be the safest material to dispense from the air within the city limits.

The townsite trees can be most effectively and safely treated using ground equipment on an individual tree basis. To insure rapid reduction of feeding larvae and provide foliage protection where

trees are highly visible, the use of carbaryl is recommended. Use of a biological pesticide, although more environmentally acceptable, would not provide adequate foliage protection to ornamental trees. It should be emphasized that ground application must be done to insure the integrity of the aerial application.

Fig. 1.--Douglas-fir tussock moth outbreak, Los Alamos, NM, 1977.

Table 1.--Douglas-fir tussock moth larval density, 1977.

No. trees sampled	No. trees infested	Midcrown density larvae/1,000 sq. in.
742	693	64.4

Table 2.--Douglas-fir tussock moth-acres defoliated, 1977.

Negligible to light	Light to moderate	Moderate to heavy
300	400	600

Table 3.--Douglas-fir tussock moth-ornamental townsite trees, 1977.

No. trees infested	No. trees uninfested	Total no. trees
552	1,233	1,785